MSMR

Medical Surveillance Monthly Report

Vol. 11 No. 1 **January 2005**

USACHPPM

Contents

Current and past issues of the MSMR may be viewed online at: *http://amsa.army.mil*

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JAN 2005		**00-00-2005 to 00-00-2005**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Medical Surveillance Monthly Report (MSMR). Volume 11, Number 1, January 2005	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **U.S. Army Center for Health Promotion and Preventive Medicine,Armed Forces Health Surveillance Center (AFHSC),2900 Linden Lane, Suite 200,Silver Spring,MD,20910**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**24**	

Deployment-related condition of special surveillance interest: Amputations

Amputations of Lower and Upper Extremities, US Armed Forces, 1990-2004

Historically, during both peace and war, acute traumatic injuries have been leading causes of hospitalizations, lost duty time, disabilities, and deaths among members of the U.S. Armed Forces and others.[1] A relatively small but significant proportion of all severe traumatic injuries result in major extremity amputations which require lifelong therapeutic and rehabilitative care. For example, during World War I, World War II, and the Korean War, approximately 1.2-1.4% of all U.S. servicemembers wounded in action sustained major limb amputations;[2] and in 1996 in the United States, the incidence of limb loss due to trauma was estimated as 5.86 per 100,000.[3]

Since October 2001, the U.S. military has conducted combat operations, primarily in Afghanistan and Iraq, as part of the global war on terrorism. During the operations, many servicemembers received severe traumatic injuries from conventional military weapons (e.g., small arms, grenades; mortar, artillery, and rocket rounds); improvised explosive devices, mines, and booby traps; and accidents (e.g., motor vehicle, aircraft). Because of improvements in force protection equipment, medical evacuation procedures, and life saving medical care, many severely injured servicemembers, who may have died in earlier wars/conflicts, survived their severe injuries with significant disabilities, including amputations.[2,4]

This report summarizes frequencies and types of traumatic amputations of lower and upper extremities and demographic and military characteristics of servicemembers affected by them during the 15-year period from 1990 through 2004.

Methods. The surveillance period was 1 January 1990 to 31 December 2004. The surveillance cohort included all individuals who served in an active or reserve component of the U.S. Armed Forces any time during the surveillance period. The Defense Medical Surveillance System (DMSS) was searched to identify all records of hospitalizations of U.S. servicemembers during the surveillance period that included a diagnosis and/or procedure code specific for a traumatic amputation of a lower and/or upper extremity. Amputations of fingers and toes were not included.

For purposes of summarizing demographic and military characteristics, each affected individual was counted only once regardless of the number of hospitalizations for amputations per individual. For purposes of summarizing numbers of amputations, only one upper and one lower extremity amputation per individual were included (because bilateral upper and/or lower extremity amputations could not be discerned reliably from available records). Finally, summaries of anatomic locations of amputations were based on the most proximal site per extremity per individual that was reported during a hospitalization during the surveillance period.

Results. During the 15-year surveillance period, 674 U.S. servicemembers were hospitalized with trauma-related amputations of extremities. More than half of all affected servicemembers were in the Army (54%); and most were enlisted (92%), males (96%), white not Hispanic (72%), and in their twenties (60%) (table 1). The military occupation with the largest number of affected servicemembers was "infantry, general" (n=115, 17%) (table 2).

Between 1990 and 2002, there were 520 traumatic amputations of upper and lower extremities. The mean number of amputations per year was 40, and the range was 25 to 59. However, in 2003 and 2004, there were 290 traumatic amputations of upper and lower extremities. Thus, the mean per year during the past 2 years was more than 2.5 times higher than the highest of any prior year (table 3, figures 1, 2).

Nearly three-fourths (72%) of all amputations included in the surveillance were of lower limbs (table 3). The most common anatomic sites were below the knee (46%) and above the knee (27%) among lower extremities; and below the elbow (36%) and above the elbow (29%) among upper extremities (table 3).

Editorial comment. This report documents the incidence of traumatic amputations of limbs among U.S. servicemembers since 1990 (average: 40 per year) and the sharp increase in 2003 and 2004 (average: 145 per year). The report clearly documents the increase in incidence in amputations since the beginning of

Figure 1. Amputations of upper extremities among active and Reserve component members of U.S. Armed Forces, by anatomic location and year, 1990-2004.

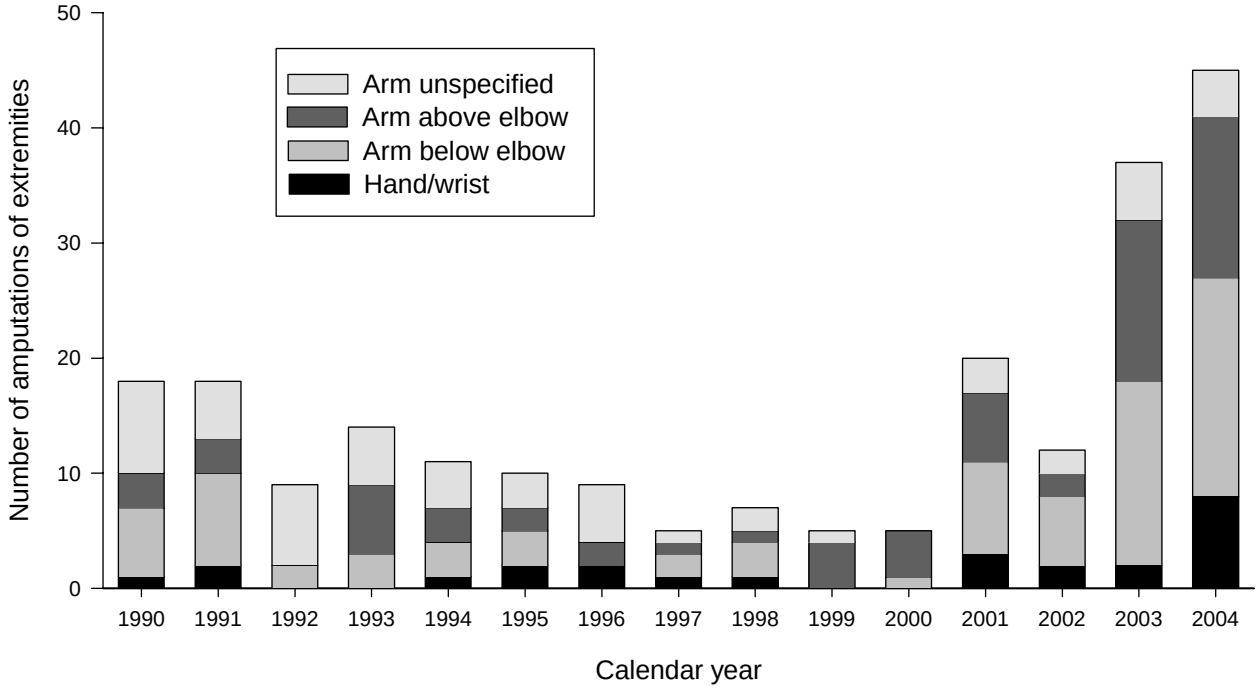
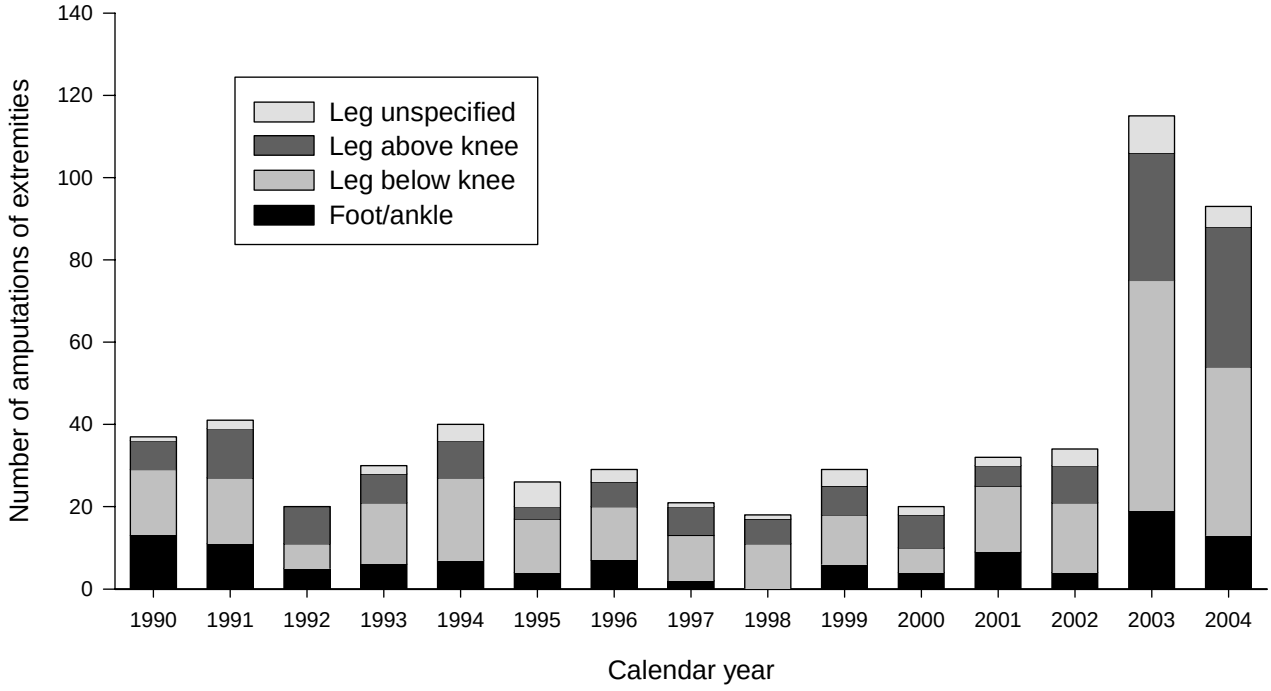


Figure 2. Amputations of lower extremities among active and Reserve component members of US Armed Forces, by anatomic location and year, 1990-2004.



combat operations in Iraq; however, it incompletely documents the natures and scopes of recent combat-related injuries. For example, many amputation-associated injuries (particularly due to blast) involve multiple limbs and/or significant co-morbidities such as traumatic brain injuries, fractures, deep venous thrombosis, peripheral neuropathies, chronic pain syndromes, post-traumatic stress disorders, and vision and hearing impairments.[2,4] The U.S. Army Amputee Patient Care Program manages a database that documents the clinical spectrums of injuries associated with amputations resulting from Operations Enduring Freedom and Iraqi Freedom since 2003 and the acute and rehabilitative care (e.g., physical therapy, prosthetics) received by affected servicemembers.[2]

Of interest, while the numbers of amputations sharply increased in 2003, the anatomic distributions of amputations remained relatively stable throughout the surveillance period. For example, lower limb amputations accounted for 73% and 72% of all amputations—and below the knee amputations accounted for 46% and 47% of all lower limb amputations—during the periods 1990-2002 and 2003-2004, respectively. Of note, in their review of amputations among U.S. Army soldiers from 1980 through 1988, Kishbaugh and colleagues reported that 63% of all single extremity amputations affected lower limbs and 47% of all lower limb amputations were below the knee.[5]

Finally, compared to military members in general, servicemembers with amputations since 1990 were more likely to be males; in the Army or Marine Corps; 20-24 years old; enlisted; and infantrymen, combat engineers, or motor vehicle operators. Of interest, Kishbaugh and colleagues found that, from 1980 to 1988, the median age of soldiers separated from service for amputations was 25; 97% were males; 93% were enlisted; and the most common military occupation was infantry.[5] The consistency of the findings suggest that servicemembers with these demographic and military characteristics have increased risks of severe traumatic extremity injuries—during training and combat operations and perhaps while off-duty.

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Table 1. Demographic and military characteristics* of servicemembers hospitalized with amputations of extremities, U.S. Armed Forces, 1990-2004

	Number	%
Total	674	100.0
Service		
Army	365	54.2
Navy	123	18.2
Air Force	81	12.0
Marines	105	15.6
Gender		
Female	27	4.0
Male	647	96.0
Age group		
<20	44	6.5
20-24	264	39.2
25-29	140	20.8
30-34	94	13.9
35-39	73	10.8
40+	59	8.8
Racial ethnic group		
Black, not Hispanic	119	18.2
White, not Hispanic	468	71.5
Hispanic	63	9.6
Other	5	0.8
Marital status		
Single, never married	334	49.8
Married	314	46.8
Other	23	3.4
Military status		
Enlisted	622	92.3
Officer or warrant officer	52	7.7
Military grade		
E1-E4	344	51.1
E5-E9	278	41.3
O1-O3 (W1-W3)	37	5.5
O4-O9 (W4-W5)	14	2.1

*missing/unknown are excluded from subgroup totals

Table 2. Military occupations* of U.S. servicemembers hospitalized with amputations of extremities, by DoD occupational groups, U.S. Armed Forces, 1990-2004

	Number	% of total
Infantry, general	115	17.1
Combat engineering, general	26	3.9
Medical care/treatment, general	25	3.7
Motor vehicle operator	25	3.7
Not occupationally qualified, general	23	3.4
Aircrew, general	20	3.0
Artillery, gunnery	18	2.7
Supply administration	18	2.7
Combat operations control, general	15	2.2
Special Forces	14	2.1
Food service, general	13	1.9
Ground, Naval arms	13	1.9
Aviation ordnance	11	1.6
Armor/amphibious, general	10	1.5
Administration, general	10	1.5
Missile artillery, operating crew	9	1.3
Explosive ordnance disposal/underwater demolition	9	1.3
Automotive, general	9	1.3
Tracked vehicles	9	1.3
Law enforcement, general	8	1.2
Communications radio	7	1.0
Missile guidance/control	7	1.0
Ammunition repair	7	1.0
Construction equipment operation	7	1.0

*Military occupational groups that accounted for 1.0% or more of all amputee servicemembers

Table 3. Amputations of extremities among active and Reserve component members, U.S. Armed Forces, by year and anatomic site, 1990-2004

	Lower extremity								Upper extremity								Total	
	Foot/ankle		Leg, below knee		Leg, above knee		Leg, unspecified		Hand/wrist		Arm, below elbow		Arm, above elbow		Arm/hand, unspecified			
	No.	% of yearly total	No.	% of yearly total	No.	% of yearly total	No.	% of yearly total	No.	% of yearly total	No.	% of yearly total	No.	% of yearly total	No.	% of yearly total	No.	% of overall total
1990	13	23.6	16	29.1	7	12.7	1	1.8	1	1.8	6	10.9	3	5.5	8	14.5	55	6.8
1991	11	18.6	16	27.1	12	20.3	2	3.4	2	3.4	8	13.6	3	5.1	5	8.5	59	7.3
1992	5	17.2	6	20.7	9	31.0	0	0.0	0	0.0	2	6.9	0	0.0	7	24.1	29	3.6
1993	6	13.6	15	34.1	7	15.9	2	4.5	0	0.0	3	6.8	6	13.6	5	11.4	44	5.4
1994	7	13.7	20	39.2	9	17.6	4	7.8	1	2.0	3	5.9	3	5.9	4	7.8	51	6.3
1995	4	11.1	13	36.1	3	8.3	6	16.7	2	5.6	3	8.3	2	5.6	3	8.3	36	4.4
1996	7	18.4	13	34.2	6	15.8	3	7.9	2	5.3	0	0.0	2	5.3	5	13.2	38	4.7
1997	2	7.7	11	42.3	7	26.9	1	3.8	1	3.8	2	7.7	1	3.8	1	3.8	26	3.2
1998	0	0.0	11	44.0	6	24.0	1	4.0	1	4.0	3	12.0	1	4.0	2	8.0	25	3.1
1999	6	17.6	12	35.3	7	20.6	4	11.8	0	0.0	0	0.0	4	11.8	1	2.9	34	4.2
2000	4	16.0	6	24.0	8	32.0	2	8.0	0	0.0	1	4.0	4	16.0	0	0.0	25	3.1
2001	9	17.3	16	30.8	5	9.6	2	3.8	3	5.8	8	15.4	6	11.5	3	5.8	52	6.4
2002	4	8.7	17	37.0	9	19.6	4	8.7	2	4.3	6	13.0	2	4.3	2	4.3	46	5.7
2003	19	12.5	56	36.8	31	20.4	9	5.9	2	1.3	16	10.5	14	9.2	5	3.3	152	18.8
2004	13	9.4	41	29.7	34	24.6	5	3.6	8	5.8	19	13.8	14	10.1	4	2.9	138	17.0
Total	110	13.6	269	33.2	160	19.8	46	5.7	25	3.1	80	9.9	65	8.0	55	6.8	810	100.0

* May include multiple amputations per service member

Malaria, US Army, 2004

Malaria is a mosquito-transmitted parasitic disease that is endemic throughout the tropics and in some temperate regions[1]. Malaria accounts for as many as 300 million acute illnesses and more than 1 million deaths each year worldwide[1]. Four *Plasmodium* species are capable of infecting humans and causing malaria: *Plasmodium falciparum* (the most deadly), *Plasmodium vivax* (the most common), *Plasmodium ovale,* and *Plasmodium malariae.*[1]

Throughout history, malaria has been a disease of military operational importance.[2,3] Currently, U.S. servicemembers are at risk of malaria when they are permanently assigned to endemic areas (such as near the Demilitarized Zone [DMZ] in Korea[4-6]); when they participate in training or military operations in endemic areas; and when they visit malarious areas during personal travels.

In the past decade, there has been a general increase in malaria incidence among U.S. soldiers, primarily due to *P. vivax* infections acquired in Korea.[4-7] More recently, malaria (particularly *P. vivax*) has threatened U.S. military forces during operations in endemic areas of Afghanistan[8,9] and Iraq.[10] For example, in 2002, 38 U.S. Army Rangers acquired vivax malaria while operating in eastern Afghanistan.[9] This report summarizes the malaria experiences of U.S. soldiers during calendar year 2004 and compares it to recent experiences.

Methods. The Defense Medical Surveillance System was searched to identify all hospitalizations and reports to the Army's Reportable Medical Events System (RMES) during calendar year 2004 that included a primary diagnosis of malaria (ICD-9-CM: 084.0-084.9) among U.S. soldiers. For the summary, only one episode of malaria per soldier was included. When multiple records were available for a soldier, the date of the earliest was considered the date of onset and the most specific diagnosis (typically from an inpatient record) was used to classify the type. Locations of malaria acquisition were estimated using the following algorithm: (1) cases diagnosed in Korea were considered Korea-acquired; (2) cases documented through RMES that listed exposures to malaria endemic locations were considered acquired in those locations (if more than one malaria endemic location was listed, the first was considered the location); (3) cases among soldiers who had been assigned to Korea within 2 years of diagnosis were considered acquired in Korea; (4) all remaining cases were considered acquired in "other/unknown" areas.

Results. In 2004, 56 U.S. Army soldiers were hospitalized for/reported with malaria. Most cases were caused by *P. vivax* (n=30) (table 1). In 2004 compared to 2003, there were approximately one-third fewer cases of malaria overall (but identical numbers due to *P. falciparum)* (figure 1). As in the recent past, most soldiers diagnosed with malaria in 2004 were younger than 30 (73%), male (98%), white non-Hispanic (77%), and in the active component (96%) (table 1).

Infections acquired in Korea (n=23) and Central Asia/Middle East (n=14) accounted for approximately two-thirds of all cases in 2004. In 2004 compared to 2003, there were the same number of Korea-acquired cases but significantly fewer from Central Asia/Middle East (figure 2).

In 2004 as in 2003, most Korea-acquired cases presented during the summer-early fall; however, cases also presented sporadically during the spring and late fall (figure 2). In contrast, in 2004, cases acquired in Central Asia/Middle East presented sporadically throughout the year (unlike in 2003, when there were clear peaks in incidence in May and June) (figure 2).

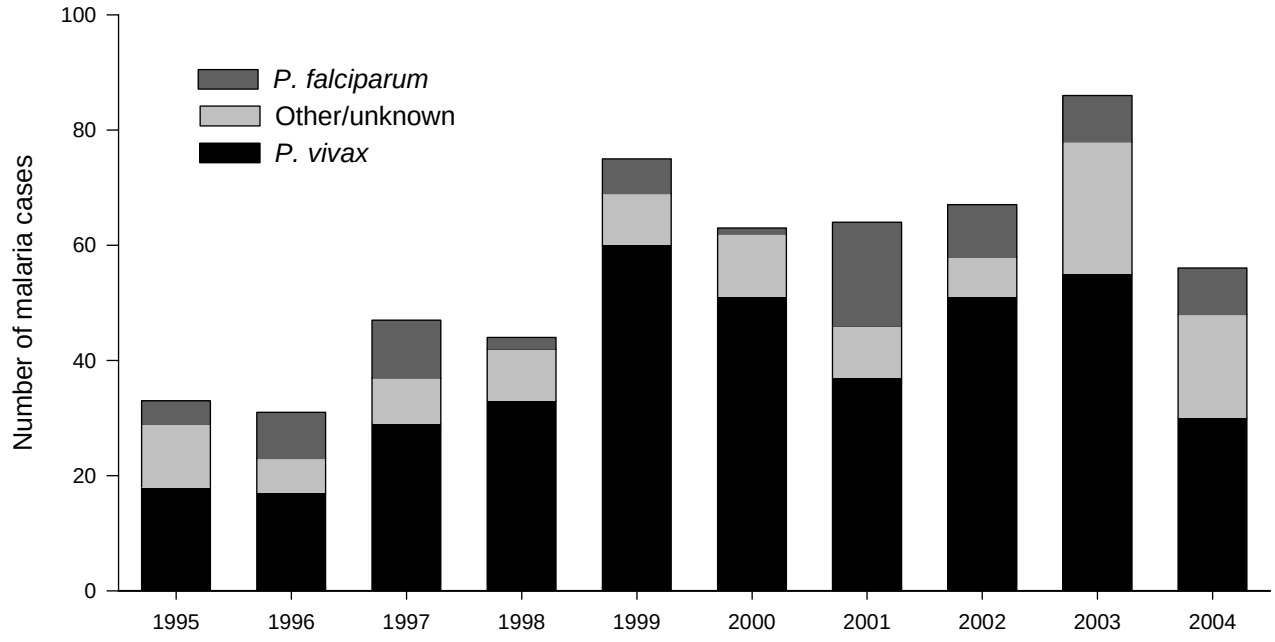
Finally, in 2004, malaria cases were reported from medical facilities in the United States (71%), Korea (18%), and Germany (11%). In the United States, cases were treated at 15 different Army medical facilities; and of these, only Fort Bragg (n=10) and Fort Drum (n=8) treated more than three cases each. Of note, 13 (57%) of 23 cases considered acquired in Korea were hospitalized/reported from medical facilities outside of Korea (table 2).

Editorial comment. In 2004, there were approximately one-third fewer cases of malaria among U.S. soldiers than in 2003. The decrease was due primarily to fewer *P. vivax* infections acquired in

Table 1. Hospitalized/reported malaria cases, by demographic characteristics of affected soldiers, by species type, U.S. Army, 2004

	P. vivax	*P. falciparum*	Other/ unknown	Total	% of total
Total	30	8	18	56	100.0
Gender					
Male	29	8	18	55	98.2
Female	1	0	0	1	1.8
Age group					
<20	1	1	0	2	3.6
20-24	16	1	7	24	42.9
25-29	8	1	6	15	26.8
30-34	3	4	3	10	17.9
35-39	1	1	1	3	5.4
40+	1	0	1	2	3.6
Race ethnicity					
White	26	2	15	43	76.8
Black	0	5	1	6	10.7
Hispanic	3	1	0	4	7.1
Other	1	0	2	3	5.4
Component					
Active	29	7	18	54	96.4
Guard	1	1	0	2	3.6
Reserve	0	0	0	0	0.0

Figure 1. Malaria cases by plasmodium species and year, U.S. Army, 1995-2004.



Central Asia. Of note, the same number of cases were considered acquired in Korea in 2004 as in 2003.

As in recent years, most malaria cases among U.S. soldiers were diagnosed at medical facilities remote from malaria endemic areas.[7,11] Many *P. vivax* infections acquired in Korea have long latency periods;[11,12] and as a result, many infections acquired during summer—fall seasons in Korea clinically present months later at military or civilian facilties outside of Korea. Similarly, delays in the clinical manifestations of *P. vivax* infections acquired in Central Asia are common;[9] and as a result, cases among soldiers infected in Afghanistan are likely to present weeks to months after they return from their deployments.[9]

More than ever, primary care providers—during all seasons and in all locations—should be alert for U.S. servicemembers who present with clinical syndromes consistent with malaria who traveled to or were assigned/deployed to malaria-endemic areas (especially in Korea and/or Afghanistan).

Finally, all soldiers at risk of malaria (and other arthropod-transmitted infections) should be informed of the nature of the risk; trained, equipped, and supplied to conduct indicated countermeasures; and monitored to ensure compliance. Personal protective measures against malaria include the proper wear of permethrin-impregnated uniforms; the use of bed nets and military-issued DEET-containing insect repellent; and compliance with prescribed chemoprophylactic drugs before, during, and after times of exposure in malarious areas.

Analysis by Jenny C. Lay, MPH, Analysis Group, Army Medical Surveillance Activity.

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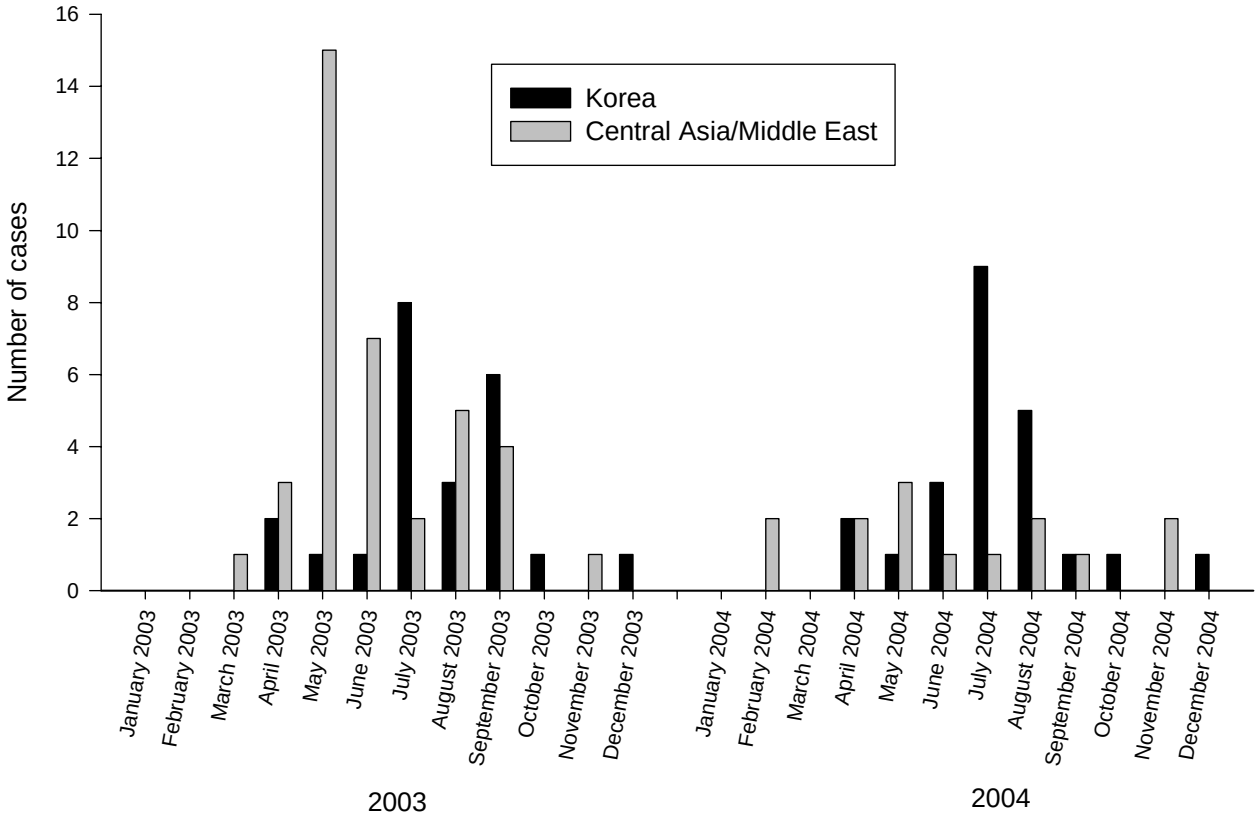
Table 2. Hospitalized/reported malaria cases among soldiers, U.S. Army, by locations of acquisition and diagnosis, US Army, 2004

Location of acquisition of plasmodium infection	Number	% of total
Africa	8	14.3
Central Asia / Middle East	14	25.0
Central/South America	1	1.8
Korea	23	41.1
Unknown	10	17.9
Location of diagnosis/report of malaria	Number	% of total
Fort Benning, GA	2	3.6
Fort Bragg, NC	10	17.9
Fort Belvoir, VA	2	3.6
Fort Bliss, TX	2	3.6
Fort Campbell, KY	3	5.4
Fort Carson, CO	1	1.8
Fort Drum, NY	8	14.3
Fort Gordon, GA	1	1.8
Fort Hood, TX	3	5.4
Fort Knox, KY	1	1.8
Fort Leonard Wood, MO	1	1.8
Fort Lewis, WA	1	1.8
Fort Polk, LA	1	1.8
Fort Riley, KS	1	1.8
Fort Wainwright, AK	3	5.4
Germany	6	10.7
Korea	10	17.9

Figure 2. Hospitalized/reported cases of malaria among U.S. soldiers, by location of acquistion of infection, by month of clinical presentation/diagnosis, January 2003-December 2004.



Update: Pre- and Post-deployment Health Assessments, US Armed Forces, September 2002-December 2004

The June 2003 issue of the *MSMR* summarized the background, rationale, policies, and guidelines related to pre-deployment and post-deployment health assessments of servicemembers.[1-10] Briefly, prior to deploying, the health of each servicemember is assessed to ensure his/her medical fitness and readiness for deployment. At the time of redeployment, the health of each servicemember is again assessed to identify medical conditions and/or exposures of concern to ensure timely and comprehensive evaluation and treatment.

Completed pre- and post-deployment health assessment forms are routinely sent (in hard copy or electronic form) to the Army Medical Surveillance Activity (AMSA) where they are archived in the Defense Medical Surveillance System (DMSS).[11] In the DMSS, data recorded on pre- and post-deployment health assessments are integrated with data that document demographic characteristics, military experiences, and medical encounters of all servicemembers (e.g., hospitalizations, ambulatory visits, immunizations).[11] The continuously expanding DMSS database can be used to monitor the health of servicemembers who participated in major overseas deployments.[11-13]

The overall success of deployment force health protection efforts depends at least in part on the completeness and quality of pre- and post-deployment health assessments. This report summarizes characteristics of servicemembers who completed pre-deployment (since 1 September 2002) and post-deployment (since 1 January 2003) forms; responses to selected questions on pre- and post-deployment forms; and changes in responses of individuals from pre-deployment to post-deployment.

Methods. For this update, the DMSS was searched to identify all pre-deployment health assessments (DD Form 2795) that were completed after 1 September 2002 (in order to include those of servicemembers who deployed in October 2002) and all post-deployment health assessments (DD Form 2796) that were completed after 1 January 2003.

Results. From 1 September 2002 to 31 December 2004, 884,138 pre-deployment health assessments were completed at field sites, shipped to AMSA, and integrated in the DMSS database (table 1). From 1 January 2003 to 31 December 2004, 722,975 post-deployment health assessments were completed at field sites, shipped to AMSA, and entered into the DMSS database (table 1).

In general, the distributions of self-assessments of "overall health" were similar among pre- and post-deployment form respondents (figure 1). For example, both prior to and after deployment, the most frequent descriptor of "overall health" was "very good." Of note, however, relatively more pre- (32%) than post- (22%) deployment respondents assessed their overall health as "excellent"; while more post- (41%) than pre- (26%) deployment respondents assessed their overall health as "good," "fair," or "poor" (figure 1).

Among servicemembers (n=376,331) who completed both a pre- and a post-deployment health assessment, nearly half (46%) chose the same descriptor of their overall health before and after deploying (figures 2, 3). Of those (n=202,414) who changed their assessments from pre- to post-deployment, approximately three-fourths (77%) changed by a single category (on a five category scale) (figure 2,3); and of those who changed by more than one category, more than 5-times as many indicated a decrement in overall health (n=40,046; 11% of all respondents) than an improvement (n=7,229; 2% of all respondents) (figure 3).

On post-deployment forms, approximately 21% of active and 37% of Reserve component respondents reported "medical/dental problems." Among active component respondents, "medical/dental problems" were more frequently reported by soldiers and Marines than by members of the other Services; while among Reservists, members of the Army, Navy, and Marines were at least twice as likely to report "medical/dental problems" as were Air Force members (table 2).

Table 1. Pre- and post-deployment health assessments, by month and year, US Armed Forces, September 2002-2002-December 2004

		Pre-deployment[1]		Post-deployment[2]	
		No.	%	No.	%
Total		884,138	100.0	722,975	100.0
2002	September	11,158	1.3		
	October	16,564	1.9		
	November	20,074	2.3		
	December	17,091	1.9		
2003	January	69,161	7.8	5,949	0.8
	February	109,797	12.4	4,690	0.6
	March	69,646	7.9	6,300	0.9
	April	37,390	4.2	19,179	2.7
	May	12,808	1.4	90,224	12.5
	June	14,379	1.6	65,026	9.0
	July	17,898	2.0	52,040	7.2
	August	16,112	1.8	34,797	4.8
	September	12,550	1.4	31,978	4.4
	October	23,840	2.7	26,179	3.6
	November	19,346	2.2	20,211	2.8
	December	35,640	4.0	20,953	2.9
2004	January	66,797	7.6	37,944	5.2
	February	38,647	4.4	31,918	4.4
	March	22,428	2.5	65,640	9.1
	April	19,270	2.2	43,476	6.0
	May	27,168	3.1	17,448	2.4
	June	23,912	2.7	27,392	3.8
	July	22,024	2.5	23,650	3.3
	August	31,876	3.6	21,273	2.9
	September	31,068	3.5	21,342	3.0
	October	33,191	3.8	11,996	1.7
	November	31,567	3.6	19,053	2.6
	December	32,736	3.7	24,317	3.4

1. Total pre deployment assessments (DD form 2795) since 1 September 2002-31 December 2004.
2. Total post-deployment assessments (DD form 2796) since 1 January 2003-31 December 2004.

Figure 1. Percent distributions of self-assessed health status, pre- and post-deployment, US Armed Forces, 1 January 2003-31 December 2004.

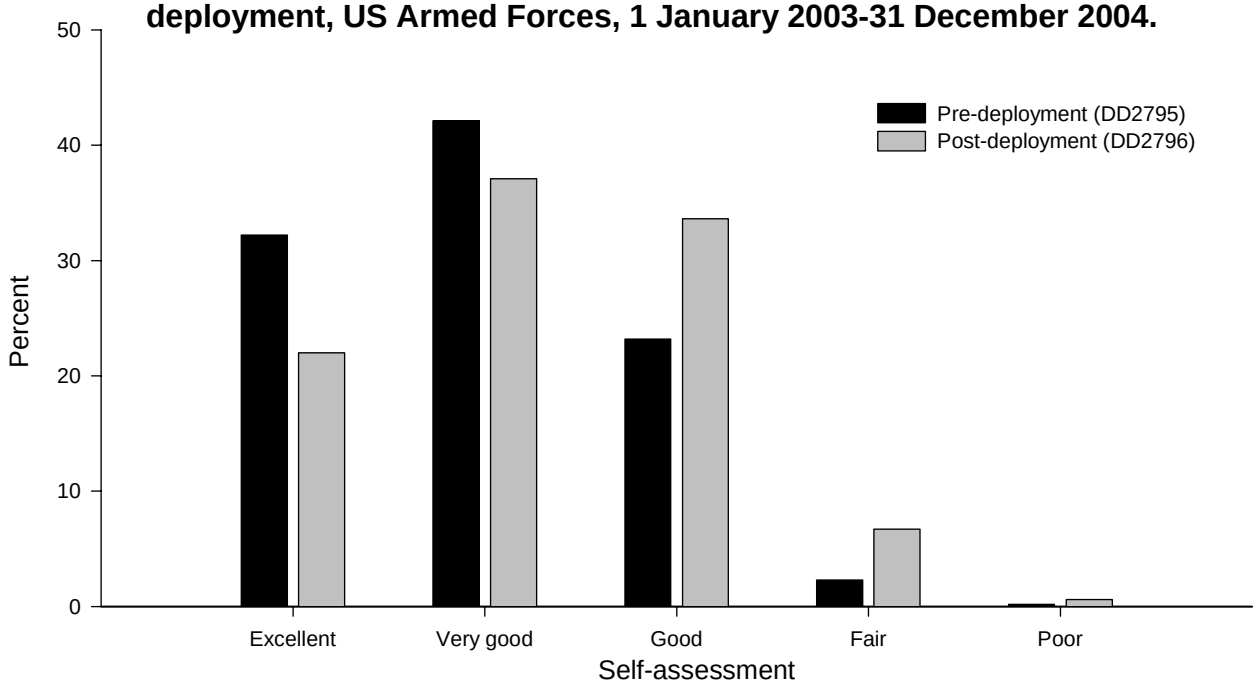
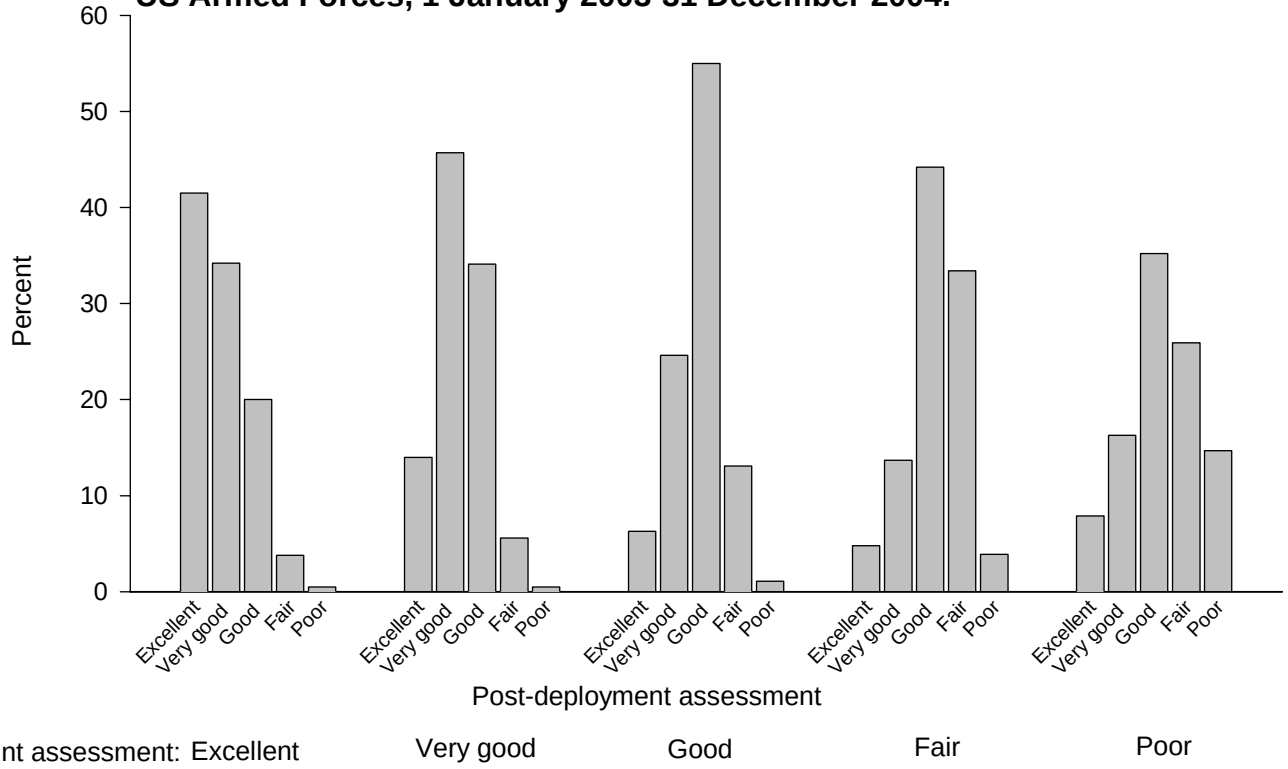


Figure 2. Self-assessed health status on post-deployment form, in relation to self-assessed health status pre-deployment, US Armed Forces, 1 January 2003-31 December 2004.



Approximately 3% and 5% of active and Reserve component respondents, respectively, reported "mental health concerns." Mental health concerns were reported relatively more frequently among soldiers (active: 5%; Reserve: 6%) than members of the other Services (table 2). From 6% (active component, Navy) to 26% (active component, Army) of post-deployment forms documented that "referrals" were indicated (table 2); and 86% and 76% of all active and Reserve component respondents, respectively, had hospitalizations and/or medical encounters within 6 months after documented post-deployment referrals (table 2).

Overall, approximately 15% of all post-deployment forms indicated deployment-related "exposure concerns" (table 3). The proportions of respondents who reported exposure concerns significantly varied from month to month and generally increased over time through the spring of 2004 (range: 3.7% [April 2003]-19.3% [April 2004]) (figure 4).

In general, the likelihood of reporting an exposure concern increased monotonically with age (table 3). Still, however, in all age groups, exposure concerns were more likely among Reserve than active component members (figure 5). In addition, members of the Army (20%) and Marine Corps (14%); females (17%); and officers (17%) were more likely to report "exposure concerns" than their respective counterparts (table 3).

Editorial comment. Since September 2002, approximately three-fourths of U.S. servicemembers have assessed their overall health as "very good" or "excellent" when they are mo-

Table 2. Responses to selected questions from post-deployment forms (DD2796) submitted since 1 January 2003, by service and component, US Armed Forces[1]

Active component	Army	Navy	Air Force	Marines	Total
SMs with DD 2796 at AMSA	183,940	71,176	66,778	59,409	381,303
Electronic version[2]	59%	2%	33%	10%	39%
General health ("fair" or "poor")	9%	5%	2%	6%	6%
Medical/dental problems	28%	12%	11%	18%	21%
Currently on profile	10%	1%	2%	3%	6%
Mental health concerns	5%	2%	1%	2%	3%
Exposure concerns	18%	5%	5%	11%	12%
Health concerns	14%	6%	5%	8%	10%
Referral indicated	26%	6%	10%	12%	17%
Med. visit following referral[3]	93%	67%	78%	62%	87%
Post deployment serum[1]	91%	77%	80%	85%	86%
Reserve component					
SMs with DD 2796 at AMSA	156,219	11,414	25,819	12,988	206,440
Electronic version[2]	56%	10%	21%	11%	48%
General health ("fair" or "poor")	11%	5%	3%	9%	9%
Medical/dental problems	41%	35%	17%	35%	37%
Currently on profile	15%	5%	2%	4%	12%
Mental health concerns	6%	3%	1%	3%	5%
Exposure concerns	23%	15%	10%	28%	21%
Health concerns	21%	21%	9%	23%	20%
Referral indicated	25%	17%	12%	24%	23%
Med. visit following referral[3]	78%	87%	60%	56%	76%
Post deployment serum[1]	88%	88%	64%	81%	85%

1. As of 31 December 2004

2. Only calculated for psot-deployment forms (DD 2796) completed since 1 June 2003.

3. Includes any hospitalization or outpatient encounter within 6 months after referral.

bilized and/or prior to deploying overseas; but only approximately 60% have assessed their overall health as "very good" or "excellent" at the end of their deployments. Most of the changes in assessments of overall health from pre- to post-deployment have been relatively minor (i.e., one category on a 5-category scale). Still, however, more than 10% of all post-deployers have indicated relatively significant declines (i.e., two or more categories) in their overall health from pre- to post-deployment. The findings are not surprising considering the extreme physical and psychological stresses associated with mobilization, overseas deployment, and harsh and dangerous living and working conditions.[14,15]

The deployment health assessment process is specifically designed to identify, assess, and follow-up as necessary all servicemembers with concerns regarding their health and/or deployment-related exposures. Overall, for example, approximately one-fifth of all post-deployers had "referral indications" documented on post-deployment health assessments; and of those, most had documented outpatient visits and/or hospitalizations within 6 months after they returned.

Of interest, "exposure concerns" among post-deploying respondents have significantly varied from month to month with a general increase in prevalences through the spring of 2004 (figure 4). Among both active and Reserve component members, prevalences of exposure concerns increased with age. In both components, servicemembers older than 40 were approximately twice as likely as those younger than 20 to report exposure concerns; however, in all age groups, Reservists were much more likely to report exposure concerns than their active component counterparts.

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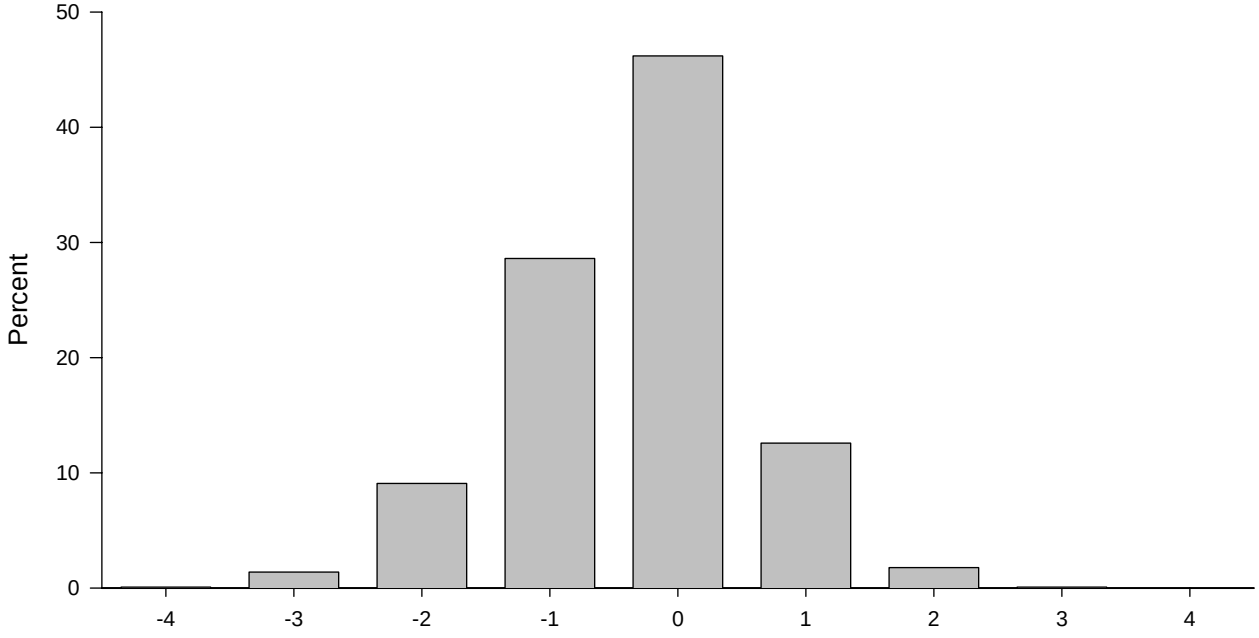
1. Medical readiness division, J-4, JCS. Capstone document: force health protection. Washington, DC. Available at: < http://www.dtic.mil/jcs/j4/organization/hssd/fhpcapstone.pdf >.

Figure 3. Distribution of self-assessed health status changes from pre- to post-deployment, US Armed Forces, 1 January 2003-31 December 2004.



Change in self-assessment of overall health status, pre- to post-deployment, calculated as:
post deployment response - pre-deployment response, using the following scale for health status:
1= "poor"; 2="fair"; 3="good"; 4="very good"; and 5="excellent."

2. Brundage JF. Military preventive medicine and medical surveillance in the post-cold war era. *Mil Med* 1998 May;163(5):272-7.
3. Trump DH, Mazzuchi JF, Riddle J, Hyams KC, Balough B. Force health protection: 10 years of lessons learned by the Department of Defense. *Mil Med* 2002 Mar;167(3):179-85.
4. Hyams KC, Riddle J, Trump DH, Wallace MR. Protecting the health of United States military forces in Afghanistan: applying lessons learned since the Gulf War. *Clin Infect Dis* 2002 Jun 15;34(Suppl 5):S208-14.
5. DoD instruction 6490.3, subject: Implementation and application of joint medical surveillance for deployments. 7 Aug 1997.
6. 10 USC 1074f, subject: Medical tracking system for members deployed overseas. 18 Nov 1997.
7. ASD (Health Affairs) memorandum, subject: Policy for pre- and post-deployment health assessments and blood samples (HA policy: 99-002). 6 Oct 1998.
8. ASD (Health Affairs) memorandum, subject: Updated policy for pre- and post-deployment health assessments and blood samples (HA policy: 01-017). 25 Oct 2001.
9. JCS memorandum, subject: Updated procedures for deployment health surveillance and readiness (MCM-0006-02). 1 Feb 2002.

Table 3. Deployment related "exposure concerns" on post-deployment health assessments,[1] US Armed Forces, January 2003-December 2004

		Exposure concerns	
	Total[2]	Number	% with exposure concerns
Total	584,441	88,877	15.2
Component			
Active	379,497	45,665	13.9
Reserve	204,944	43,212	27.3
Service			
Army	338,430	67,263	19.9
Navy	82,574	5,066	6.1
Air Force	91,044	6,243	6.9
Marine Corps	72,393	10,305	14.2
Age (years)			
<20	19,373	1,443	7.4
20-29	309,785	39,887	12.9
30-39	162,062	27,735	17.1
>39	93,216	19,811	21.3
Gender			
Men	518,294	77,495	15.0
Women	66,145	11,382	17.2
Race/ethnicity			
Black	86,785	17,357	20.0
Hispanic	47,971	9,504	19.8
Other	1,156	212	18.3
White	318,751	56,240	17.6
Grade			
Enlisted	510,041	76,414	15.0
Officer	74,393	12,458	16.7

1. Post-deployment health assessments (DD Form 2796) with completion dates: 1 January 2003-31 December 2004.
2. Total does not reflect missing responses to exposure concerns or missing characteristics.

10. USD (Personnel and Readiness) memorandum, subject: Enhanced post-deployment health assessments. 22 Apr 2003.
11. Rubertone MV, Brundage JF. The Defense Medical Surveillance System and the Department of Defense Serum Repository: glimpses of the future of comprehensive public health surveillance. *Am J Pub Hlth* 2002 Dec;92(12):1900-4.
12. Brundage JF, Kohlhase KF, Gambel JM. Hospitalization experiences of U.S. servicemembers before, during, and after participation in peacekeeping operations in Bosnia-Herzegovina. *Am J Ind Med* 2002 Apr;41(4):279-84.
13. Brundage JF, Kohlhase KF, Rubertone MV. Hospitalizations for all causes of U.S. military service members in relation to participation in Operations Joint Endeavor and Joint Guard, Bosnia-Herzegovina, January 1995 to December 1997. *Mil Med* 2000 Jul;165(7):505-11.
14. Hyams KC, Wignall FS, Roswell R. War syndromes and their evaluation: from the U.S. Civil War to the Persian Gulf War. *Ann Intern Med* 1996 Sep 1;125(5):398-405.
15. Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *N Engl J Med* 2004 Jul 1;351(1):13-22.

Figure 4. Prevalence (%) of post-deployment forms that indicate "exposure concerns," by month, US Armed Forces, January 2003-December 2004.

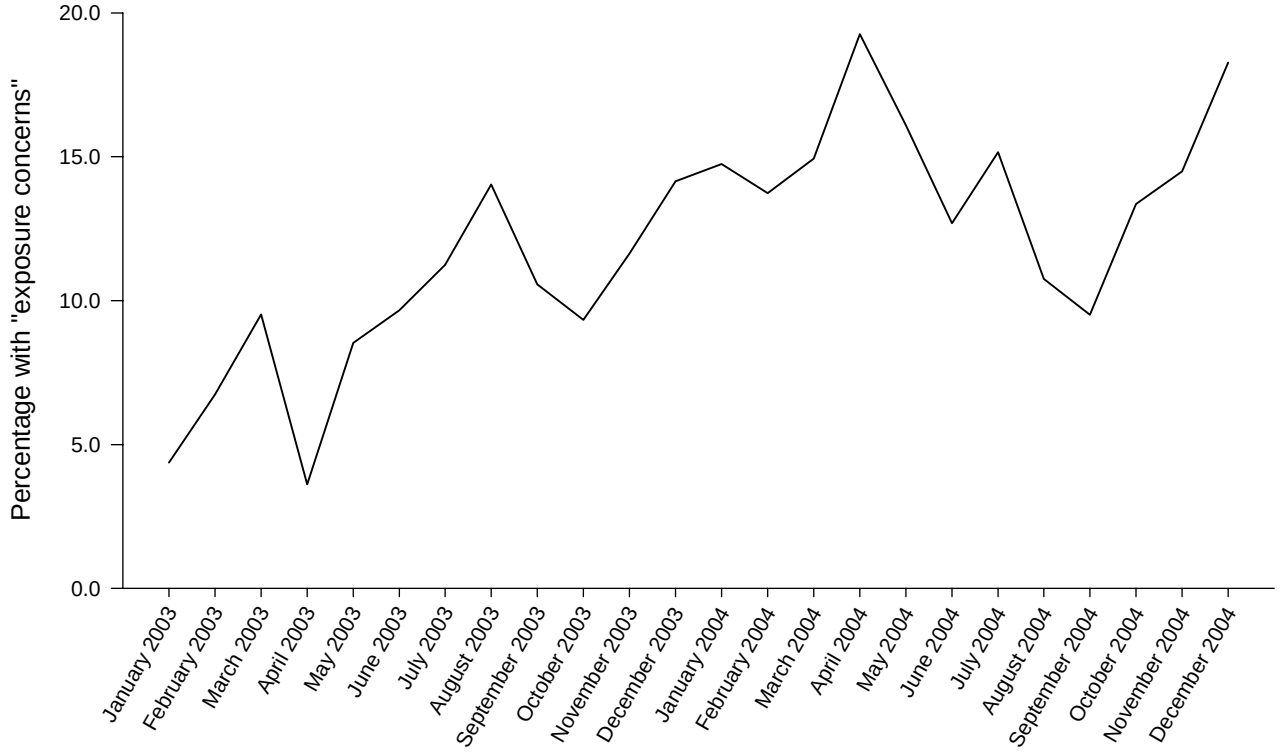
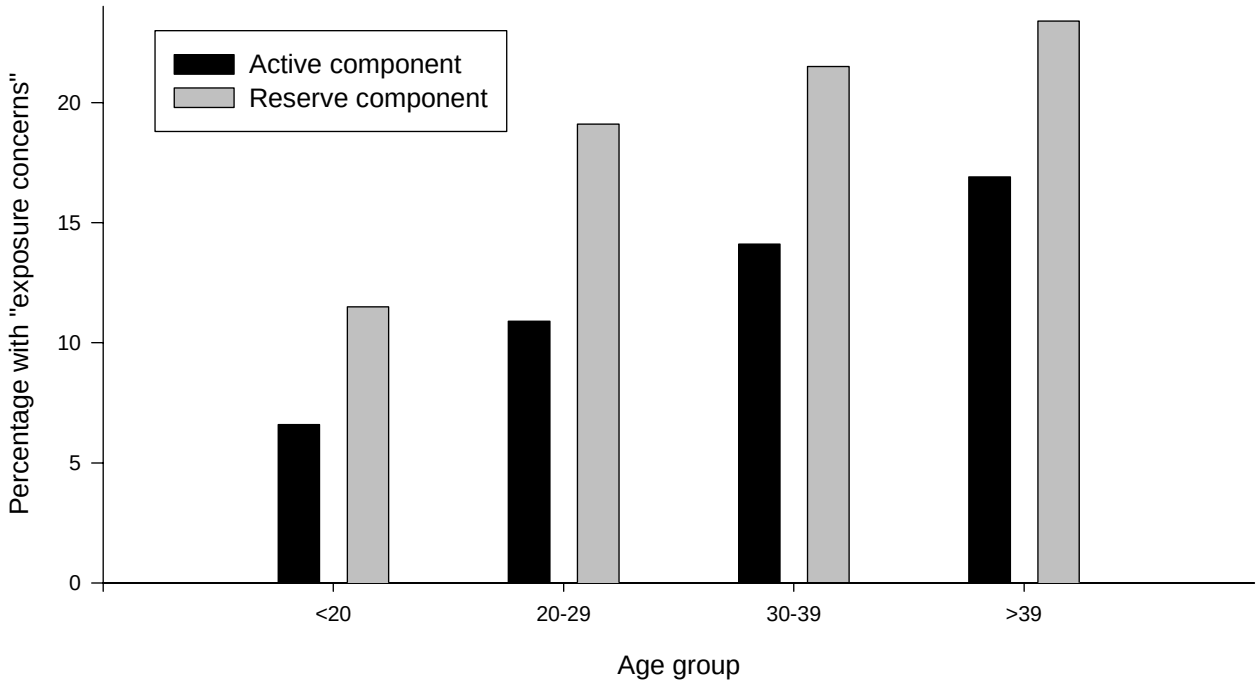
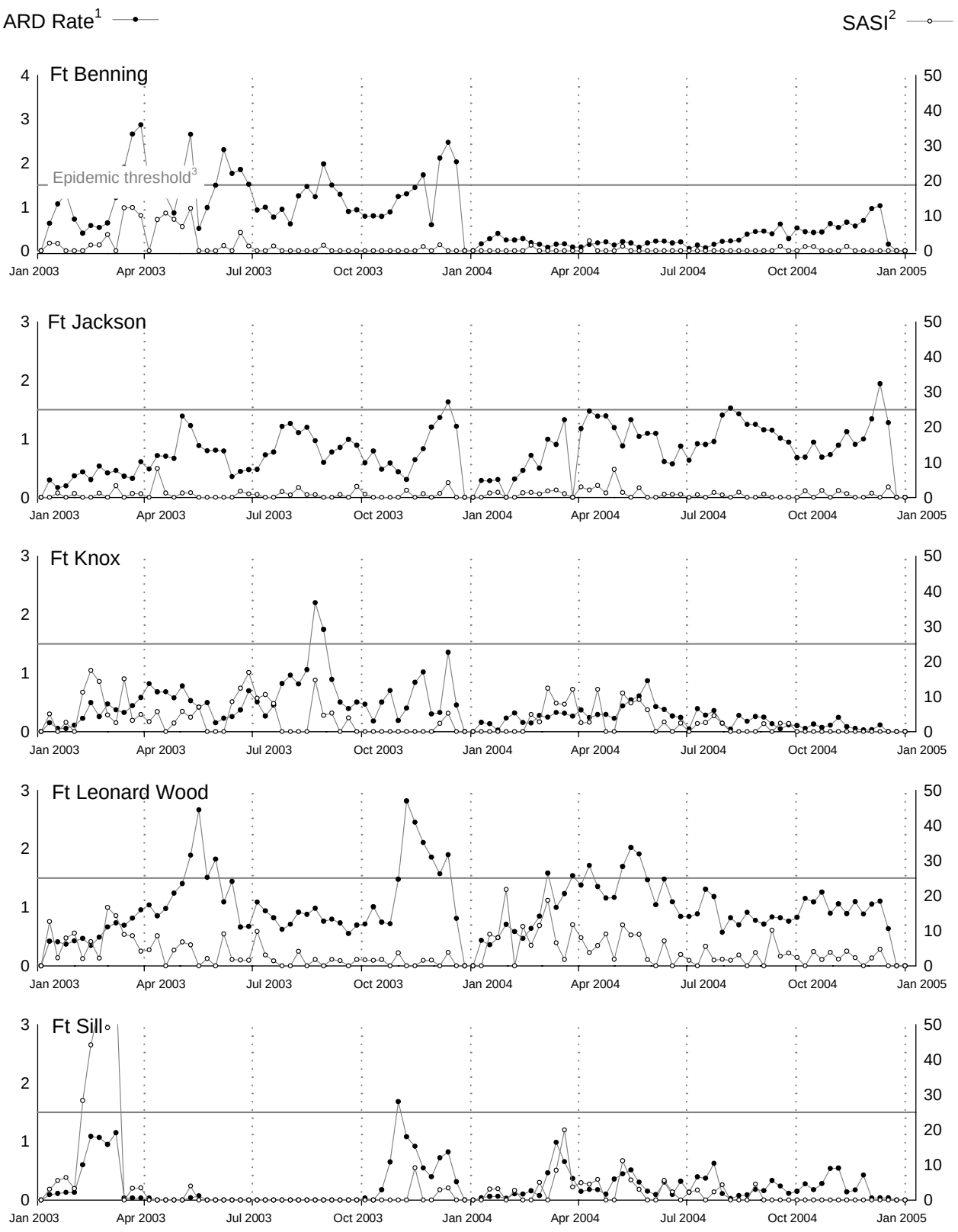


Figure 5. Prevalence (%) of post-deployment forms that indicate "exposure concerns," by age group and component of respondent, US Armed Forces, January 2003-December 2004.



Acute respiratory disease (ARD) and streptococcal pharyngitis (SASI), Army basic training centers, by week through January 10, 2005.



[1]ARD rate = cases per 100 trainees per week

[2]SASI (Strep ARD surveillance index) = (ARD rate)x(rate of Group A beta-hemolytic strep)

[3]ARD rate >=1.5 or SASI >=25.0 for 2 consecutive weeks indicates an "epidemic"

Sentinel reportable events for all beneficiaries[1] at US Army medical facilities, cumulative numbers[2] for calendar years through December 31, 2003 and 2004

Reporting location	Number of reports all events[3]		Food-borne								Vaccine Preventable					
			Campylo-bacter		Giardia		Salmonella		Shigella		Hepatitis A		Hepatitis B		Varicella	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
NORTH ATLANTIC																
Washington, DC Area	406	281	.	3	4	1	3	2	3	4	.	.	.	3	2	4
Aberdeen, MD	102	67	.	.	.	.	.	1	.	.	.	.	.	.	.	.
FT Belvoir, VA	277	283	10	10	4	2	11	6	4	2	.	2	.	.	.	1
FT Bragg, NC	1,916	1,984	8	10	.	.	30	48	20	1	.	.	.	.	2	.
FT Drum, NY	194	175	.	.	1	.	.	1	.	.	.	.	.	.	2	.
FT Eustis, VA	471	237	.	1	.	.	1	3	.	.	.	.	.	.	2	.
FT Knox, KY	254	225	3	5	.	4	5	1	.	.	.	.	.	1	1	.
FT Lee, VA	218	194	.	.	.	.	2	.	.	.	.	.	.	.	.	.
FT Meade, MD	117	186	.	1	1	1	.	.	1	.	.	.	.	.	.	.
West Point, NY	85	75	2	1	.	.	2	1	.	.	1	.	1	1	.	.
GREAT PLAINS																
FT Sam Houston, TX	219	343	.	.	.	2	6	3	.	1	.	.	.	.	.	2
FT Bliss, TX	441	389	2	1	4	7	3	10	1	12	.	1	2	3	1	.
FT Carson, CO	685	684	13	2	7	2	3	4	2	1	4	.	.	1	1	.
FT Hood, TX	1,827	1,430	9	8	.	.	28	14	107	59	1	.	1	1	.	.
FT Huachuca, AZ	77	109	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Leavenworth, KS	46	42	2	2	.	2	1	1	1	.	.	.	.	.	.	.
FT Leonard Wood, MO	206	256	6	1	.	2	1	3	.	.	.	.	1	1	4	1
FT Polk, LA	223	217	1	2	.	1	3	10	1	.	.	.	2	2	.	.
FT Riley, KS	249	266	4	1	6	2	1	1	.	.	1	1	2	.	.	.
FT Sill, OK	251	202	.	.	.	1	.	3	1	5	.	.	.	.	.	.
SOUTHEAST																
FT Gordon, GA	324	224	.	1	1	.	3	6	.	.	.	.	2	2	.	.
FT Benning, GA	462	467	1	.	6	6	9	16	8	3	.	.	.	.	.	1
FT Campbell, KY	482	848	4	7	8	3	4	5	1	8	.	.	.	.	.	4
FT Jackson, SC	245	336	.	.	.	.	1	.	.	.	1	.	.	.	.	3
FT Rucker, AL	74	74	.	.	.	1	6	3	7	.	2	.	1	.	.	1
FT Stewart, GA	350	645	.	2	.	2	16	12	14	4	.	3	.	3	1	.
WESTERN																
FT Lewis, WA	714	542	3	7	7	2	7	5	3	3	1	.	.	1	.	.
FT Irwin, CA	61	72	.	.	.	.	.	.	.	.	.	.	.	.	.	.
FT Wainwright, AK	193	231	2	1	.	.	1	2	.	.	.	1	.	1	.	.
OTHER LOCATIONS																
Hawaii	1,074	825	24	20	9	8	11	30	4	.	.	.	2	3	1	2
Europe	1,451	1,384	19	20	.	2	19	28	1	1	9	7	1	1	3	3
Korea	576	540	.	1	.	.	2	1	.	.	1	.	1	2	6	4
Total	**14,270**	**13,833**	**113**	**107**	**58**	**51**	**179**	**220**	**179**	**104**	**21**	**15**	**16**	**26**	**26**	**26**

1. Includes active duty servicemembers, dependents, and retirees.

2. Events reported by January 7, 2003 and 2004.

3. Seventy events specified by Tri-Service Reportable Events, Version 1.0, July 2000.

Note: Completeness and timeliness of reporting vary by facility.

Source: Army Reportable Medical Events System.

(Cont'd) Sentinel reportable events for all beneficiaries[1] at US Army medical facilities, cumulative numbers[2] for calendar years through December 31, 2003 and 2004

Reporting location	Arthropod-borne				Sexually Transmitted								Environmental			
	Lyme Disease		Malaria		Chlamydia		Gonorrhea		Syphilis[4]		Urethritis[5]		Cold		Heat	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
NORTH ATLANTIC																
Washington, DC Area	2	4	2	.	161	126	24	20	3	7	.	.	1	29	.	11
Aberdeen, MD	2	.	.	.	39	61	12	4	.	.	.	.	9	.	.	.
FT Belvoir, VA	2	1	1	2	196	222	40	26	.	3	.	.	.	.	1	2
FT Bragg, NC	1	.	8	10	1,308	1,354	264	290	6	11	111	137	5	3	79	112
FT Drum, NY	.	.	.	4	133	96	25	5	1	.	.	.	4	1	.	.
FT Eustis, VA	.	2	.	.	188	191	44	22	1	1	.	.	.	.	.	3
FT Knox, KY	.	.	.	1	209	178	30	18	.	.	.	.	.	.	1	14
FT Lee, VA	.	1	.	.	142	160	27	30	.	.	.	.	.	.	.	1
FT Meade, MD	.	3	.	.	95	156	20	24	.	.	.	.	.	.	.	.
West Point, NY	36	25	.	.	25	40	3	1	.	.	.	.	1	1	8	4
GREAT PLAINS																
FT Sam Houston, TX	.	1	.	2	169	223	33	50	1	1	.	.	.	.	.	22
FT Bliss, TX	.	3	.	.	281	252	59	63	2	1	.	.	.	.	1	3
FT Carson, CO	.	.	.	1	380	536	39	61	1	1	41	62	2	.	1	.
FT Hood, TX	.	1	3	3	889	788	275	240	5	1	202	235	5	.	11	49
FT Huachuca, AZ	.	.	1	.	71	103	5	6	.	.	.	.	.	.	.	.
FT Leavenworth, KS	.	.	1	.	37	27	3	9	.	.	.	.	.	.	.	.
FT Leonard Wood, MO	.	.	.	1	168	183	20	48	1	.	.	.	2	1	3	8
FT Polk, LA	.	.	1	1	162	162	45	35	.	2	.	.	.	.	8	2
FT Riley, KS	.	1	.	1	197	178	10	42	.	.	.	.	.	5	4	22
FT Sill, OK	.	.	.	.	148	133	21	22	1	1	32	.	.	2	4	32
SOUTHEAST																
FT Gordon, GA	.	.	2	1	276	177	24	27	5	2	.	.	.	.	2	3
FT Benning, GA	.	.	25	4	265	245	117	111	.	.	.	.	.	.	29	80
FT Campbell, KY	1	.	2	3	355	591	92	114	1	1	.	.	2	.	9	81
FT Jackson, SC	.	.	.	1	180	190	33	33	.	1	.	.	5	6	22	61
FT Rucker, AL	.	.	.	.	39	52	12	12	.	.	1	.	.	.	4	4
FT Stewart, GA	.	.	2	.	173	352	85	148	.	3	35	42	.	.	14	46
WESTERN																
FT Lewis, WA	.	1	2	1	383	375	75	55	.	.	88	74	1	1	2	2
FT Irwin, CA	.	.	.	.	47	60	13	10	.	.	.	.	.	.	.	2
FT Wainwright, AK	.	.	1	2	116	128	25	12	.	.	.	.	34	59	.	.
OTHER LOCATIONS																
Hawaii	.	.	2	2	740	585	132	114	1	.	.	.	.	.	21	15
Europe	5	16	8	6	1,057	1,012	245	217	2	2	1	.	4	2	33	7
Korea	.	.	19	11	440	431	68	58	3	3	8	.	5	6	12	18
Total	**49**	**59**	**80**	**57**	**9,069**	**9,367**	**1,920**	**1,927**	**34**	**41**	**519**	**550**	**80**	**116**	**269**	**604**

4. Primary and secondary.

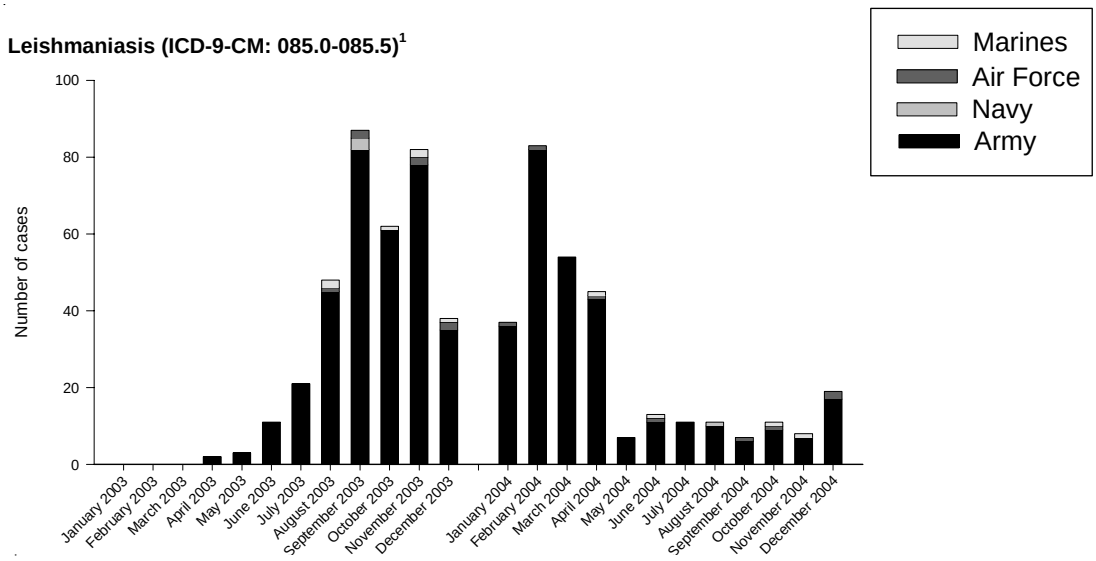
5. Urethritis, non-gonococcal (NGU).

Note: Completeness and timeliness of reporting vary by facility.

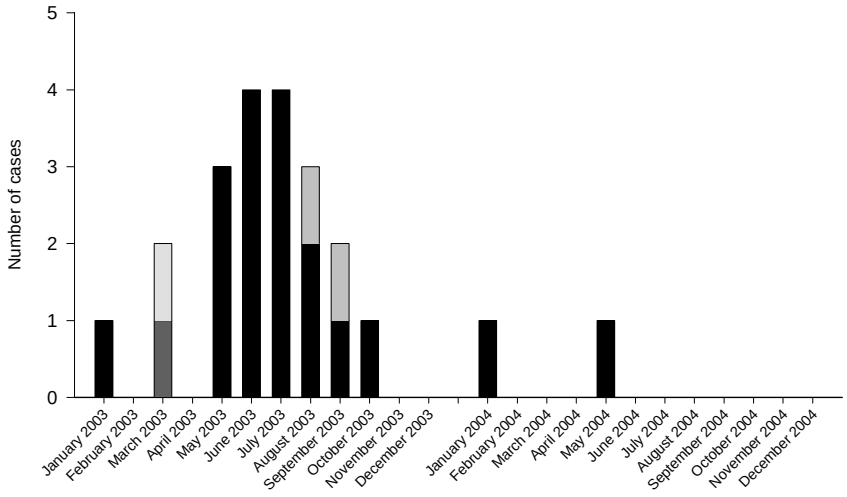
Source: Army Reportable Medical Events System.

Deployment-related conditions of special surveillance interest, US Armed Forces, by month and Service, January 2003-December 2004

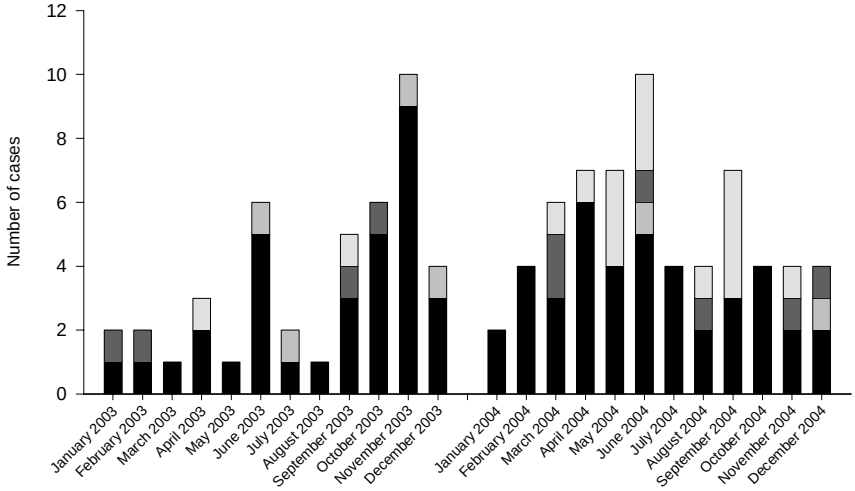
Leishmaniasis (ICD-9-CM: 085.0-085.5)[1]



Acute respiratory failure/ARDS (ICD-9-CM: 518.81, 518.82)[2]



Deep vein phlebitis/thrombophlebitis and/or pulmonary embolism/infarction (ICD-9-CM: 451.1, 451.81, 415.1)[3]



Footnotes:

1. Indicator diagnosis (one per individual) during a hospitalization, ambulatory visit, and/or from a notifiable medical event during/after service in OEF/OIF.
2. Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 30 days of returning from OEF/OIF.
3. Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of retuning from OEF/OIF.

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The Medical Surveillance Monthly Report (MSMR) is prepared by the Army Medical Surveillance Activity , Directorate of Epidemiology and Disease Surveillance, US Army Center for Health Promotion and Preventive Medicine (USACHPPM).

Data in the MSMR are provisional, based on reports and other sources of data available to AMSA.

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